

WHAT IS CLAIMED IS:

1. A bottling plant for filling bottles with liquid beverage filling material, said bottling plant comprising:

a filling machine being configured and disposed to fill cleaned bottles with liquid beverage filling material;

said filling machine comprising:

a rotor being configured and disposed to rotate around a vertical machine axis and having a peripheral portion;

a plurality of filling positions disposed at said peripheral portion of said rotor;

each of said plurality of filling positions comprising:

a bottle carrier being configured and disposed to provide bottles for filling;

a filling device being disposed above a bottle carrier and configured to fill a bottle disposed on said bottle carrier;

each filling device comprising:

apparatus configured to introduce a predetermined volume of liquid beverage filling material into the interior of bottles to a predetermined level of liquid beverage filling material;

apparatus configured to terminate the filling of bottles upon liquid beverage filling material reaching the predetermined level in bottles;

a cleaning station being configured and disposed to clean bottles prior to filling with a liquid beverage filling material;

apparatus configured and disposed to move bottles to said

cleaning station;

said cleaning apparatus comprising:

a body comprising an interior, and exterior, an inlet structure, and an outlet structure;

said interior comprising a chamber;

said inlet structure comprising a first nozzle being configured and disposed in a first position to inject a jet of air in a first direction into and against a wall of said chamber;

said inlet structure comprising a second nozzle being configured and disposed in a second position to inject a jet of cleaning medium in a second direction into said chamber;

the first direction being transverse to the second direction;

said first nozzle and said second nozzle being configured and disposed to direct a stream of air laden with cleaning medium droplets against a wall of said chamber;

apparatus being configured and disposed to heat said chamber to a temperature sufficient to vaporize cleaning medium droplets deposited on the wall of said chamber;

said outlet structure also being configured and disposed to permit delivery of a mixture of air and vaporized cleaning medium through said outlet structure of said body and into the interior of a bottle to be cleaned; and

apparatus being configured and disposed to terminate delivery of a mixture of air and vaporized cleaning medium from said outlet structure;

a closing station being configured and disposed to close bottles filled with liquid beverage filling material;

apparatus being configured and disposed to move bottles filled with liquid beverage filling material from said filling machine to said closing station;

apparatus being configured and disposed to containerize bottles filled with liquid beverage filling material;

apparatus being configured and disposed to move filled bottles from said closing station to said containerization station; and

control apparatus being configured and disposed to control at least operation of said filling machine.

2. The bottling plant according to claim 1, wherein:

said body comprises an interior having a width dimension;

said air nozzle is configured to generate a jet of air, being a jet of air substantially narrower than said interior width dimension;

said vaporization chamber comprises an annular chamber having two circular annular concentric walls;

said air nozzle is positioned to direct a jet of air tangential to a concentric circular path disposed between said two circular annular concentric walls.

3. The bottling plant according to claim 2, comprising all of:

(a), (b), (c), (d), (e), (f), (g), (h), (i), (j), and (k), wherein (a), (b), (c), (d), (e), (f), (g), (h), (i), (j), and (k) comprise:

(a) said interior comprises a chamber having at least one wall configured to be heated by said heating apparatus to vaporize cleaning medium deposited on said at least one wall;

(b) said body comprises a plurality of passages configured and

disposed to connect said annular vaporization chamber and said outlet structure with one another;

said heating apparatus is configured and disposed to heat said plurality of passages to maintain a mixture of air and cleaning medium within said plurality of passages at at least a temperature at which cleaning medium is vaporized;

(c) said body comprises a collecting chamber configured and disposed to store a mixture of air and vaporized cleaning medium;

said collecting chamber is connected between said annular vaporization chamber and said outlet structure;

(d) said body comprises a plurality of passages configured and disposed to connect said annular vaporization chamber and said collecting chamber with one another;

(e) said heating apparatus is configured and disposed to heat said plurality of passages to maintain a mixture of air and cleaning medium within said plurality of passages at at least a temperature at which cleaning medium is vaporized;

(f) said cleaning medium nozzle comprises a structure configured to inject hydrogen peroxide present in an aqueous solution as a cleaning medium and said cleaning medium nozzle is configured to withstand the cleaning medium;

(g) said plurality of passages comprise at least one of: straight passages and circuitous passages;

(h) said body comprises apparatus configured and disposed to terminate the flow of a mixture of air and cleaning medium;

(i) said body comprises at least a first portion and a second portion; and

fasteners to connect said first portion and said second portion to one another;

(j) said outlet structure comprises a structure configured and disposed to inject a mixture of air and cleaning medium into the interior of a container to be cleaned; and

(k) said collecting chamber comprises an annular chamber having two circular annular concentric walls.

4. A method of operating a cleaning station configured to clean containers in a container filling plant configured to fill beverage containers with a liquid beverage filling material, said container cleaning station comprising: a body comprising an inlet structure and an outlet structure; said inlet structure comprising a structure being configured and disposed to provide a flow of air in a first direction; said inlet structure comprising a structure being configured and disposed to provide a flow of cleaning medium in a second direction transverse to the flow of air to mix air and cleaning medium; a heating arrangement being configured and disposed to heat and vaporize cleaning medium in said body; and said outlet structure being configured and disposed to direct delivery of a mixture of air and vaporized cleaning medium onto at least one surface of a container to be cleaned; said method comprising the steps of:

injecting a flow of air in a first direction into said body with said structure being configured and disposed to provide a flow of air in a first direction;

impinging said flow of air with a flow of cleaning medium in a second direction with said structure being configured and disposed to

provide a flow of cleaning medium in a second direction, which second direction being transverse to the flow of air to mix air and cleaning medium;

vaporizing cleaning medium in said body; and

directing a mixture of air and vaporized cleaning medium onto at least one surface of a container to be cleaned.

5. The method of operating a cleaning station configured to clean containers according to claim 4, wherein said body comprises an interior having a width dimension; said structure configured to provide a flow of air comprises a nozzle configured to generate a jet of air, being a jet of air substantially narrower than said interior width dimension; said interior comprises a chamber configured to vaporize cleaning medium; said vaporization chamber comprises an annular chamber having two circular annular concentric walls; said structure being configured and disposed to inject a flow of air in a first direction into said interior comprises a nozzle; said air nozzle is positioned to direct a jet of air tangential to a concentric circular path disposed between said two circular annular concentric walls; said method further comprising the steps of:

injecting a jet of air, substantially narrower than said interior width dimension, in the first direction; and

injecting a jet of air tangential to the concentric circular path disposed between said two circular annular concentric walls.

6. The method of operating a cleaning station configured to clean containers according to claim 5, comprising all of: (a), (b), (c),

(d), (e), (f), (g), (h), (i), (j), and (k), wherein (a), (b), (c), (d), (e), (f), (g), (h), (i), (j), and (k) comprise:

(a) said interior comprises a chamber having at least one wall configured to be heated by said heating arrangement to vaporize cleaning medium deposited on said at least one wall;

comprising the step of:

vaporizing cleaning medium deposited on said at least one wall;

(b) said body comprises a plurality of passages configured and disposed to connect said annular vaporization chamber and said outlet structure with one another;

said heating arrangement is configured and disposed to heat said plurality of passages to maintain a mixture of air and cleaning medium within said plurality of passages at at least a temperature at which cleaning medium is vaporized;

comprising the step of:

maintaining a mixture of air and cleaning medium within said plurality of passages at at least a temperature at which cleaning medium is vaporized;

(c) said body comprises a collecting chamber configured and disposed to store a mixture of air and vaporized cleaning medium;

said collecting chamber is connected between said annular vaporization chamber and said outlet structure;

comprising the step of:

storing a mixture of air and vaporized cleaning medium in said collecting chamber;

(d) said body comprises a plurality of passages configured and

disposed to connect said annular vaporization chamber and said collecting chamber with one another;

comprising the step of:

passing a mixture of air and vaporized cleaning medium from said annular vaporization chamber through said plurality of passages into said collecting chamber;

(e) said heating arrangement is configured and disposed to heat said plurality of passages to maintain a mixture of air and cleaning medium within said plurality of passages at at least a temperature at which cleaning medium is vaporized;

comprising the step of:

maintaining a mixture of air and cleaning medium within said plurality of passages at at least a temperature at which cleaning medium is vaporized;

(f) said cleaning medium nozzle comprises a structure configured to inject hydrogen peroxide in an aqueous solution as a cleaning medium and said cleaning medium nozzle is configured to withstand the cleaning medium;

comprising the step of:

injecting hydrogen peroxide in an aqueous solution as medium;

(g) said plurality of passages comprise at least one of: straight passages and circuitous passages;

(h) said body comprises apparatus configured and disposed to terminate the flow of a mixture of air and cleaning medium;

comprising the step of:

terminating the flow of a mixture of air and cleaning

medium;

(i) said body comprises at least a first portion and a second portion; and

fasteners to connect said first portion and said second portion to one another;

(j) said outlet structure comprises a structure configured and disposed to inject a mixture of air and cleaning medium into the interior of a container to be cleaned;

comprising the step of:

injecting a mixture of air and cleaning medium into the interior of a container to be cleaned; and

(k) said collecting chamber comprises an annular chamber having two circular annular concentric walls.

7. A cleaning station for a container filling plant configured to fill beverage containers with a liquid beverage filling material, said cleaning station comprising:

a body comprising an inlet structure and an outlet structure;

said inlet structure comprising a structure being configured and disposed to provide a flow of air in a first direction;

said inlet structure comprising a structure being configured and disposed to provide a flow of cleaning medium in a second direction transverse to the flow of air to mix air and cleaning medium;

a heating arrangement being configured and disposed to heat and vaporize cleaning medium in said body; and

said outlet structure being configured and disposed to direct delivery of a mixture of air and vaporized cleaning medium onto at

least one surface of a container to be cleaned.

8. The cleaning station according to claim 7, wherein:
said body comprises an interior having a width dimension; and
said structure configured to provide a flow of air comprises a
nozzle configured to generate a jet of air, being a jet of air
substantially narrower than said interior width dimension.

9. The cleaning station according to claim 8, wherein:
said structure configured to provide a flow of cleaning medium
comprises a nozzle configured to generate a liquid jet of cleaning
medium.

10. The cleaning station according to claim 9, wherein:
said interior comprises a chamber having at least one wall
configured to be heated by said heating arrangement to vaporize
cleaning medium deposited on said at least one wall.

11. The cleaning station according to claim 10, wherein:
said vaporization chamber comprises an annular chamber having
two circular annular concentric walls; and
said air jet nozzle is positioned to direct a jet of air tangential
to a concentric circular path disposed between said two circular
annular concentric walls.

12. The cleaning station according to claim 11, wherein:
said body comprises a collecting chamber configured and

disposed to store a mixture of air and vaporized cleaning medium;
and

said collecting chamber is connected between said annular vaporization chamber and said outlet structure.

13. The cleaning station according to claim 12, wherein:
said body comprises a plurality of passages configured and disposed to connect said annular vaporization chamber and said collecting chamber with one another.

14. The cleaning station according to claim 13, wherein:
said heating arrangement is configured and disposed to heat said plurality of passages to maintain a mixture of air and cleaning medium within said plurality of passages at at least a temperature at which cleaning medium is vaporized.

15. The cleaning station according to claim 14, wherein:
said cleaning medium nozzle comprises a structure configured to inject hydrogen peroxide present in an aqueous solution as a cleaning medium and said cleaning medium nozzle is configured to withstand the cleaning medium.

16. The cleaning station according to claim 15, wherein:
said plurality of passages comprise at least one of: straight passages and circuitous passages.

17. The cleaning station according to claim 16, wherein:

said body comprises apparatus configured and disposed to terminate the flow of a mixture of air and cleaning medium.

18. The cleaning station according to claim 17, wherein:
said body comprises at least a first portion and a second portion; and
fasteners to connect said first portion and said second portion to one another.

19. The cleaning station according to claim 18, wherein:
said outlet structure comprises a structure configured and disposed to inject a mixture of air and cleaning medium into the interior of a container to be cleaned.

20. The cleaning station according to claim 19, wherein:
said collecting chamber comprises an annular chamber having two circular annular concentric walls.